



**A COMMANDER'S GUIDE TO
INFECTIOUS WASTE
MANAGEMENT
AT ARMY HEALTH CARE FACILITIES**



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FEBRUARY 1990

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February 1990

PREFACE

PURPOSE

This document provides current information and guidance regarding the management of infectious waste.

ACKNOWLEDGEMENTS

In appreciation for their time and assistance in developing this document, we acknowledge the U.S. Army Health Services Command, Walter Reed Army Institute of Research, and Armed Forces Institute of Pathology.

TECHNICAL ASSISTANCE

Requests for additional assistance and guidance may be directed to the Waste Disposal Engineering Division at AUTOVON 584-2953/2954 or commercial (301) 671-2953/2954.

SUGGESTED IMPROVEMENTS

The proponent of this guide is the U.S. Army Environmental Hygiene Agency (USAEHA). Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to Commander, U.S. Army Environmental Hygiene Agency, ATTN: HSHB-ME-S, Aberdeen Proving Ground, MD 21010-5422.

INTRODUCTION

This guide is intended for use by Health Care Facility (HCF) Commanders. It will help the Commander take a proactive role in infectious waste management by:

- Providing an overview of present regulations and guidelines,
- Offering insight to future regulations,
- Presenting a quick summary of treatment and disposal options, and
- Summarizing State regulations and listing state points of contact.

The document leads the Commander through a logical thought process by posing questions and offering some realistic and practicable answers. Though the guide is based on regulation, it should not be construed as a policy document. Policy that has not been set forth in Federal, State, local or Army regulations is set by commanders.

WHY IS INFECTIOUS WASTE MANAGEMENT AN ISSUE?

Recent, highly publicized issues such as medical debris washing up on beaches and increasing numbers of AIDS cases have focused public attention on medical waste. Improper management of this waste raises concern over the health risk posed by its infectious character, the potential safety hazards posed by needles and other sharps, and the aesthetic degradation of exposed environments.

Currently available data do not suggest that improper hospital waste disposal has caused disease or that stricter regulation of these wastes will negate beach wash ups. In fact, with proper handling, treatment, and disposal, medical wastes are believed to offer minimal health and environmental risks. Though not all medical wastes are infectious, it is their potential infectiveness which has roused public concern and spurred legislation.

WHAT IS INFECTIOUS WASTE?

Though there is no universally accepted definition for infectious waste, the definitions offered by regulatory agencies are similar. The Environmental Protection Agency (EPA), the Centers for Disease Control (CDC), and the Occupational Safety and Health Administration (OSHA) agree that "infectious waste" includes those wastes with the potential for causing infection and for which special precautions appear prudent.

The EPA defines infectious waste as any waste capable of producing infectious disease. That is, the waste must contain pathogens of sufficient quantity and virulence to result in an infectious disease in a susceptible host. This definition incorporates the intent of definitions offered by OSHA, the CDC and Army Regulation. We use the EPA's definition as the basis for this guide.

Some State and local regulations use a similar, general definition. Others list categories of waste that are considered infectious.

In 1986, the EPA published its "Guide for Infectious Waste Management". This guide provides a list of recommended as well as optional infectious waste categories. More recently, Congress mandated the EPA to determine which medical wastes would be regulated under the Medical Waste Tracking Act of 1988 (MWTa). The EPA's final rule, 40 CFR 259², regulates the same wastes as were recommended in the 1986 guide, with one exception. The Act includes an "unused sharps" category. This category, however, is regulated for hazards other than its infectious character. Although the Guide, is somewhat dated, it still provides the best description of infectious waste categories. The following table lists both the infectious and optional infectious waste categories.

EPA INFECTIOUS AND OPTIONAL INFECTIOUS WASTE CATEGORIES

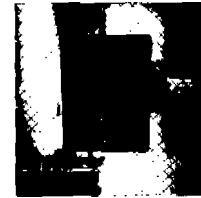
Infectious Waste

Isolation waste

Examples

Generated by hospitalized patients isolated to protect others from communicable disease. (1)

1



Cultures and stocks of infectious agents and associated biologicals

Specimens from medical and pathology laboratories. Includes culture dishes and devices used to transfer, inoculate, and mix. Also includes discarded live and attenuated vaccines. (2)

2



Human blood and blood products

Waste blood, serum, plasma and blood products.

Pathological waste

Tissues, organs, body parts, and body fluids removed during surgery and autopsy.

Contaminated sharps

Contaminated hypodermic needles, syringes, scalpel blades, **pasteur** pipettes, and broken glass. (3)

3



Contaminated animal carcasses, body parts, and bedding

From animals intentionally exposed to pathogens in research, biologicals production, or in vivo pharmaceuticals testing. (4)

OPTIONAL INFECTIOUS WASTE CATEGORIES

Optional Wastes

Wastes from surgery and autopsy

Examples

Soiled dressings, sponges, drapes, underpads, and surgical gloves.

4



Contaminated laboratory wastes

Specimen containers, slides, and cover slips; disposable gloves, lab coats, and aprons.

Dialysis unit wastes

Tubing, filters, disposable sheets, towels, gloves aprons, and lab coats.

Contaminated equipment

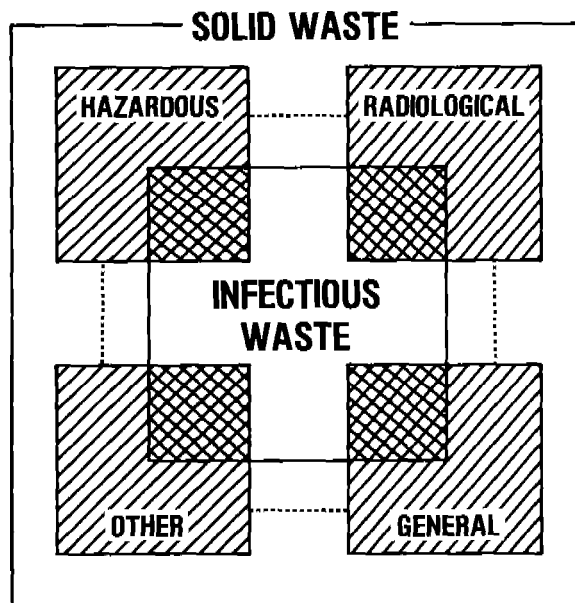
Equipment used in patient care, medical laboratories, research, and in the production and testing of **certian** pharmaceuticals.

WHAT IS NOT INFECTIOUS WASTE?

The decision to handle wastes as infectious is made by the Infection Control Committee and is based on applicable State and local regulations.

The figure shows the relationship of infectious waste to the remainder of the solid waste stream within the HCE

THE HOSPITAL WASTE STREAM



The overlapping areas represent both mixtures of waste streams and wastes which pose more than one hazard. Mixtures occur when wastes are not properly segregated and the potential for cross-contamination is introduced. Multiple hazards are inherent in some wastes which are not mixtures. An example would be a syringe used to inject radioactive tracers into an infected individual. This syringe must be handled with all the precautions applicable to infectious and radiological wastes, along with special precautions for sharps.

The dotted line represents the fact that the other waste streams may also overlap.

HAZARDOUS WASTE which is listed or identified in Title 40 Code of Federal Regulations (CFR), Part 261(3), is regulated under specific EPA standards. Hazardous waste is not included in the infectious waste category. Those wastes which are both hazardous and infectious, particularly with regard to laboratory solvents and reagents, are discussed in US. Army Environmental Hygiene Agency Technical Guide No. 147(4).

RADIOLOGICAL WASTE is regulated by the Nuclear Regulatory Commission (NRC), the Department of Transportation (DOT), state agencies, and the EPA. It is not included in the infectious waste category.

OTHER REGULATED MEDICAL WASTE includes those medical wastes generated within the HCF that are regulated for reasons other than their infectious character (e.g. unused syringes, pharmaceutical wastes, and those pathological wastes which are not designated as infectious) and are not included in the infectious waste category.

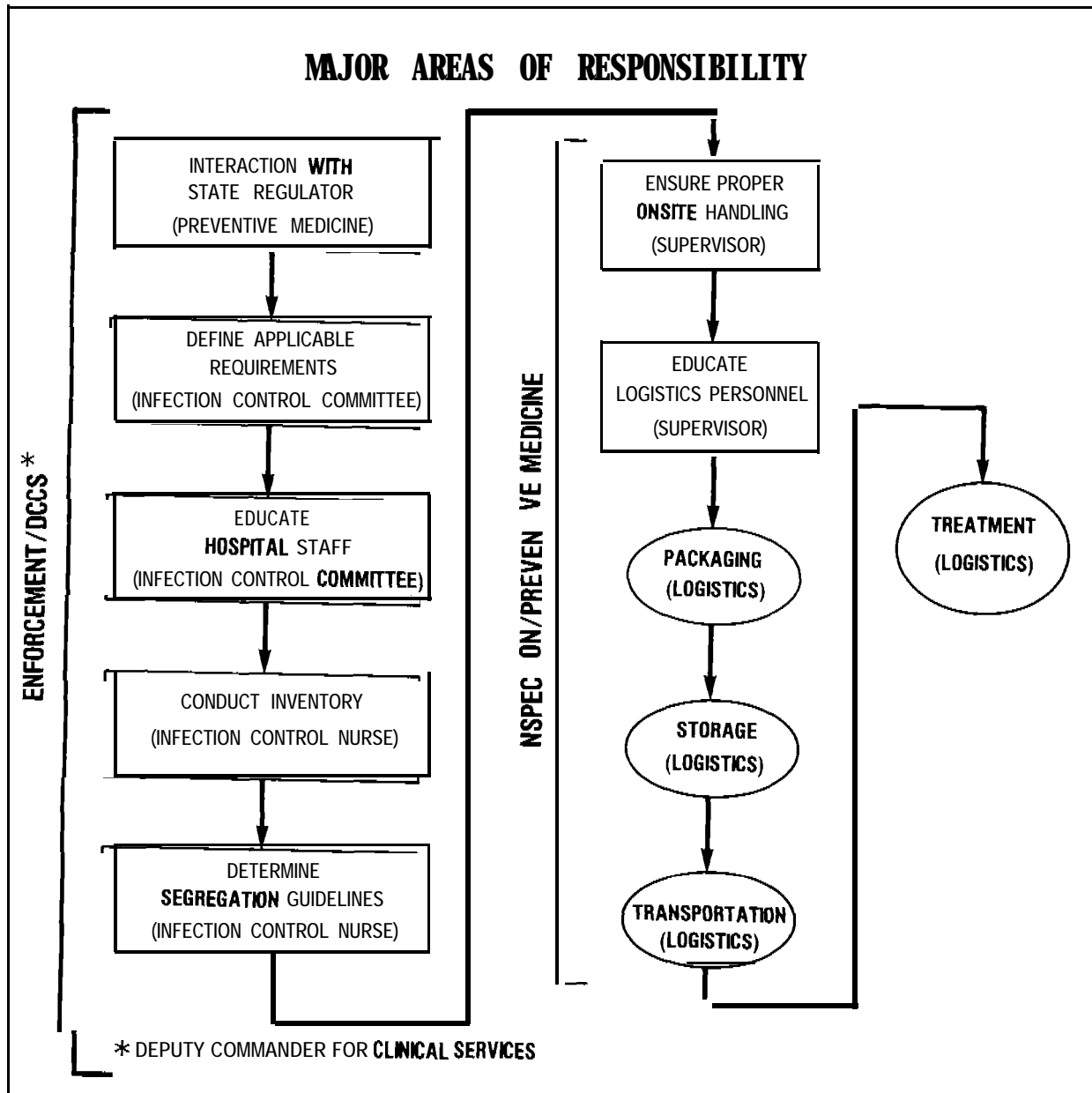
GENERAL WASTE is solid waste which is not regulated as hazardous, radiological, medical, or infectious. Trash and garbage generated in administrative and supply areas are examples of general waste.

MIXTURES of waste streams should be managed with all the precautions applicable to each of the waste components.

RESPONSIBILITIES

WHAT ARE THE MAJOR AREAS OF RESPONSIBILITY?

The diagram depicts the major areas of responsibility when managing infectious waste and lists the responsible party. This is a general diagram and is not necessarily applicable to all situations.



describes effective waste management and treatment options. Many of these guidelines were incorporated into this document and are described in later sections.

The CDC provides pertinent infection control guidelines in four separate reports^{5, 6, 7, 8}. The most significant recommendation in these reports is the application of "Universal Precautions." This guidance

suggests that blood and body fluid precautions be used for all patients regardless of their bloodborne infection status. Universal precautions stem mainly from the fear of exposure to the viruses responsible for causing AIDS and Hepatitis B. In effect, all blood, blood products, body fluids containing visible blood, and other specific body fluids such as cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, amniotic fluid, cervical secretions, and semen should be managed as infectious waste. Universal precautions do not apply to feces, nasal secretions, sputum, perspiration, tears, urine and vomitous unless they contain visible blood.

The OSHA is attempting to respond to petitions for federal standards regarding infectious waste management. In May of 1989 OSHA published its Proposed Rules for the Occupational Exposure to Bloodborne Pathogens⁹. The proposed rules are subject to revision and are far from final rulemaking. They do, however, provide a preview to what may become a final rule. The following items are discussed in the proposed rule:

1. The application of 'Universal Precautions' to prevent contact with blood and other potentially infectious materials.
2. Infectious waste container requirements.
3. Requirements regarding color coding and labeling of infectious waste containers.
4. Requirements for the disposal of sharps.
5. Decontamination requirements for solid and liquid infectious wastes.
6. Controlled access to areas which pose a potential biological hazard.
7. Use of the universal biohazard symbol to identify the actual or potential presence of a biological hazard.
8. Training requirements for all employees with occupational exposure.
9. Recordkeeping requirements.

Army Regulation 40-5(10) describes the areas of responsibility and the requirements for management of infectious waste at HCFs. The requirements are general and may not incorporate specific state regulations. In fact, since the current publication of AR 40-5, the majority of states have enacted/revised infectious waste management regulations or laws of their own.

The MWTa was signed into law on November 1, 1988. Among other things, the MWTa requires the establishment of a demonstration program for tracking medical waste, a report to Congress on currently available treatment and disposal methods, and a report prepared by the Agency for Toxic Substances and Disease Registry (ATSDR) on the hazards of medical waste. Later sections of this guide address the MWTa in more detail.

Nearly all fifty states regulate medical waste to some extent. These regulations are extremely diverse and vary from simple definitions to stringent treatment, storage, and disposal requirements. A list of state points of contact is provided in the appendix. The regulatory climate is in rapid change and it is incumbent upon the individual installations to stay informed. We recommend you maintain a dialogue with your state contact, especially in regards to the status of infectious waste regulation. Military organizations must comply with military regulations and also applicable Federal, State and local regulations.

DEFINING INFECTIOUS WASTE

Commanders must be prepared to meet future, stringent infectious waste regulations. The first step towards preparation is to determine a local HCF definition for infectious waste.

The definitions that were discussed earlier were offered as guidelines only. Each individual facility must incorporate these Federal, and any applicable State or local definitions into a single working definition for the facility. A facility SOP which specifically defines the categories of waste to be considered infectious needs to be developed.

INFECTIOUS WASTE INVENTORY

The next logical step is to conduct an infectious waste inventory at the HCF

WHICH DEPARTMENTS WITHIN MY FACILITY GENERATE INFECTIOUS WASTE?

First, determine what wastes are generated by which department, and more specifically, which departments generate infectious waste. The next table shows the five common waste streams within the health care facility and lists the departments which are most likely to generate these wastes.



DEPARTMENT WASTE STREAM BREAKDOWN					
Waste Streams					
Department	Radioactive	Hazardous	General	Other	Infectious
Admissions			X		
Emergency			X	X	X
Laboratory		X	X	X	X
Clinic			X	X	X
Cafeteria			X		
X-Ray	X		X	X	X
Radiology	X		X	X	
Outpatient			X	X	X
Laundry		X	X		X
Podiatry			X	X	
Mental Health			X		
Oncology		X	X	X	
ICU			X	X	X
CCU			X	X	X
Obstetrics			X	X	X
Operating Room			X	X	X
Central Supply		X	X	X	
EN& T			X	X	X
Storage (waste)		X	X	X	X
Necropsy		X	X	X	X
Isolation			X	X	X
Patient Rooms			X	X	X
Housekeeping		X	X		
Nurses Station			X	X	
Pharmacy		X	X	X	

WHAT TYPES OF INFECTIOUS WASTES ARE GENERATED?

Second, determine what types of infectious wastes are generated. This step is needed to determine future packaging requirements and also to determine volume and mass.

The following examples demonstrate how this information can be used:

Supply those departments which generate waste syringes and sharps with puncture resistant containers.

Normally, liquid wastes may be disposed of through the sanitary sewer system. When this is not an option, however, supply those departments generating liquid wastes with leakproof containers.

Liquid and glass wastes are heavy, whereas dressings and sheets are relatively light. Supply departments which generate heavier wastes with sturdier containers.

HOW MUCH INFECTIOUS WASTE IS GENERATED?

Finally, volume and mass estimates are needed to determine the size and adequacy of on-site waste treatment facilities and the cost of off-site disposal.

Waste treatment units such as incinerators and autoclaves must be able to handle the waste loads with minimum storage time. These units have load and capacity limits for safe and efficient operation. The size of the waste stream will dictate the capacity of new treatment units.

Transport and disposal contractors normally charge the generator per pound of waste. Accurate mass estimates are needed to reliably determine costs.

Two factors will greatly influence the amount of infectious waste generated: the categories of infectious waste which are included in the definition, and the emphasis placed on waste stream segregation. Though commanders may choose to include additional wastes as infectious; Federal, State, and local regulation will define what must be included. Commanders can impart the greatest influence on amounts generated by emphasizing segregation efforts.

Even command emphasis will be ineffective if the waste generators and handlers do not understand the procedure. Employees must be informed of the potential health and safety hazards and trained in appropriate handling and disposal methods.

TRAINING

A training program which assures knowledge and understanding of the desired waste handling process is a necessity. Members of the Infection Control Committee should develop and implement a training program for hospital staff. Though the training of contracted housekeeping personnel is normally conducted by the contractor, it too should be overseen by the Committee. Annual refresher training is also required. Document all the training programs, to include topics of discussion and names of those in attendance.

WASTE SEGREGATION, PACKAGING, AND STORAGE

WHAT GUIDELINES SHOULD I FOLLOW FOR THE SEGREGATION AND ACCUMULATION OF INFECTIOUS WASTE?

Federal, State and local regulations will ultimately determine the minimum standards of an infectious waste management program. Commanders, however, have the option to expand on these regulations and develop a program which will best serve their facility and community. Where regulations do not exist, the following recommendations will serve as minimum standards:

SEGREGATION

Segregate infectious waste from the remaining waste streams at the point of generation. The individuals responsible for operating the sections or activities which generate the waste are best qualified to identify its hazards and ensure proper segregation.

Further separate any wastes which pose multiple hazards (e.g. contaminated sharps or wastes which are both infective and radioactive) to ensure complete treatment and compliance with Federal and State regulation.

Discard infectious waste directly into rigid, leakproof containers or plastic bags which are clearly identifiable and distinguishable from the other waste containers.

Mark containers with the universal biohazard symbol and use plastic bags which are distinctive in color or marked with the biohazard symbol. Red or orange plastic bags are generally used to identify infectious waste.



PACKAGING

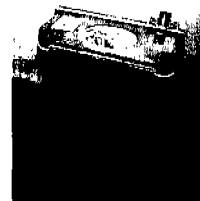
Proper packaging will protect waste handlers and the public from hazards posed by leakage and spills. That is, packaging should not rip, puncture, or burst under normal operating loads and conditions.

Dispose of liquid wastes and pathological wastes, which have been ground, through a sanitary sewer only if the receiving treatment plant provides secondary treatment, and regulation permits. Otherwise, pour them in capped or tightly stoppered bottles or flasks. Place these in plastic buckets which are sealed to prevent spills. Pour large quantities of liquid waste into buckets directly and seal them.

Place solid or semi-solid wastes such as pathological wastes, animal carcasses, and laboratory wastes in durable, tear-resistant, and opaque plastic bags which can be readily identified as containing infectious wastes.

Place sharps in impervious, rigid, and puncture-resistant containers which are marked with the universal biohazard symbol. Place these containers in all treatment rooms where sharps are routinely used. This will keep medical personnel from bending, breaking, or recapping needles when traveling to remote containers.

Health Services Command verbally advises HCF's to manage sharps containers by either locking the container to a mounting device which is securely fastened to the building structure, or locating the container in an area which is under continuous visual supervision of ward or clinic personnel. Action is currently being taken to revise AR 190-50 (11), paragraph 3-6b to reflect the current policy.



STORAGE

Though infectious waste should be treated as soon as possible, some temporary storage is inevitable. Consider the following four factors when storing infectious waste:

Package Integrity – Packaging should deter rodents and vermin and should provide containment throughout the waste management process.

Temperature – Microbial growth and odor problems increase with increasing temperatures. Some local transporters refuse to move infectious waste unless it has been refrigerated and some states have established temperature requirements.

Duration – Keep storage times as short as possible.

Storage Facility – Locate the storage area at or near the treatment site when possible. Limit the access, keep it free of rodents and vermin, and post it with the universal biohazard symbol. If wastes are placed in dumpsters outside of the facility, lock them to prevent all public access.



TRANSPORTATION OF INFECTIOUS WASTE

WHAT GUIDELINES SHOULD I FOLLOW FOR THE HANDLING AND TRANSPORTING OF INFECTIOUS WASTE?

Our recommendations are based on EPA guidelines. Sources will vary and, once again, State and local regulations should be consulted for minimum standards.

Within the health care facility:

Do not use mechanical devices to transfer or load infectious waste because they may rupture packaging. Carts are suitable, but should be disinfected frequently and should not be used for any other materials prior to decontamination.

Place bags in a second rigid, leakproof container, or seal one plastic bag inside another. These should be easily identifiable by color and/or use of the universal biohazard symbol.

Seal or cover all containers during transport and storage.

Do not compact infectious waste containers prior to treatment.

Disinfect all surfaces, interior and exterior, of reuseable infectious waste containers between uses.

From outlying clinics onpost:

Some personnel have, in the past, used privately owned vehicles for the transport of infectious waste from outlying clinics to onpost treatment facilities or storage areas. This practice must be discontinued. Only government vehicles which are easily cleaned and disinfected should be used for this purpose. We recommend a closed bed pickup truck which affords both public protection and barrier protection to the driver.

WHAT GUIDELINES SHOULD I FOLLOW WHEN SHIPPING INFECTIOUS WASTE OFFSITE?

All commanders must be aware that neither responsibility nor legal liability ends when wastes leave the facility. Waste generators are responsible for assuring proper treatment and disposal of their wastes. Commanders must, therefore, ensure all in-house and contracted waste handlers meet the requirements for the safe transport and disposal of infectious wastes.

State and local regulations may require transporter permits and may also regulate the volume of waste which can be transported. Review and implement all applicable transporter regulations.



Transport infectious waste in rigid, leakproof containers. The bed of a truck does not provide such containment. To maintain the integrity of packaging and prevent spills, place bags of infectious waste in rigid, secondary containers prior to loading them in vehicles.

When reuseable containers are used for transport of bagged waste, disinfect them after each use. Single use containers are usually destroyed as part of the treatment process.

"Backhauling" is the practice of accepting a payload to haul back, once the initial payload has been delivered. This is more profitable than running a truck back empty. For example, a truck delivers crates of bananas to a warehouse. Then it hauls empty boxes and crates from the warehouse to a waste-burning incinerator. Another example is a truck which delivers refrigerated foods to the hospital cafeteria and then hauls infectious waste from the hospital to a waste treatment facility. Though backhauling is not presently illegal, clearly there are some instances in which it should be. Due to the potential for cross contamination, we recommend that all backhauling practices be discontinued immediately.

WHAT IS THE MEDICAL WASTE TRACKING ACT AND DOES IT APPLY TO ME?

The MWTA was signed into law on November 1, 1988. The law established a two year demonstration program to study the effects of a cradle to grave system for the management of medical waste. The pilot program is effective from 22 June 1989 through 22 June 1991. Connecticut, New Jersey, New York, Rhode Island and the Commonwealth of Puerto Rico are participating in the program.

Section 11002 of the Act designates the following general types or classes of medical wastes:

(1) Cultures and stocks of infectious agents and associated biologicals, (2) pathological waste, (3) human blood and blood products, (4) used sharps, (5) contaminated animal carcasses, (6) surgery or autopsy waste, (7) laboratory wastes, (8) dialysis wastes, (9) discarded medical equipment, and (10) isolation wastes. The Act required the EPA to develop tracking requirements for types 1-5. The EPA Administrator chose to exclude types 6-10 from tracking because he determined that improper management of these wastes would not pose a substantial hazard to health or the environment.

Installations located within the states covered by the MWTA must comply with the Act.

WHAT ARE THE POSSIBLE OUTCOMES OF THE MWTA?

Depending on the results of the demonstration program, the EPA may impose Federal regulations or develop guidance for State legislative and regulatory programs. Guidance or regulations are likely to cover the following items:

1. Waste segregation requirements
2. Containment requirements.
3. Labeling requirements.
4. Transportation requirements.
5. Record keeping and reporting requirements for generators that incinerate medical wastes on-site.

The possibility exists that Federal or State regulations will require a nationwide or statewide medical waste tracking system similar to that required in the demonstration program.

WHAT ARE MY INFECTIOUS WASTE TREATMENT OPTIONS?

Though treatment options are somewhat limited at this time, new techniques are being tested and will be available in the future. Some common treatment methods are defined and discussed in this section and the next table presents a comparison of their characteristics. This section also mentions some newly developed techniques.

PROS AND CONS OF VARIOUS INFECTIOUS WASTE TREATMENT METHODS

<u>Treatment Method</u>	Pros	cons
Incineration	<p>Suitable for almost all wastes</p> <p>80-95% volume reduction</p> <p>Widely accepted</p> <p>Can recover energy</p>	<p>Operation is complex</p> <p>Requires large volumes to be cost effective</p> <p>Testing is difficult and expensive</p> <p>Strictly regulated (e.g. emissions)</p> <p>High capital, operational, and maintenance costs</p>
Steam Sterilization	<p>Effective for wastes which allow steam to penetrate</p> <p>Relatively easy to operate</p> <p>Affordable with smaller quantities</p> <p>Moderate capital and operational costs, low maintenance costs</p> <p>Few legal requirements other than routine testing</p>	<p>Not effective for high density wastes</p> <p>Only 20% volume reduction</p> <p>Treated waste is noxious; no change in appearance</p>
Gas/Vapor Sterilization	<p>Effective for wastes which allow gases to penetrate</p> <p>Onsite use is cost effective</p> <p>Few legal requirements</p>	<p>No volume reduction</p> <p>High safety risk</p> <p>High operational costs</p> <p>High risk of toxic gas release to air</p>
Chemical/Mechanical Disinfection	<p>Treats virtually all wastes</p> <p>80% volume reduction</p> <p>Moderate capital cost</p>	<p>Routine testing may be difficult</p> <p>High risk of chemical discharge to water</p> <p>May not be well accepted legally</p>

Modified and Reprinted From Reference 12

INCINERATION is the combustion of wastes under excess air conditions to form ash, noncombustible residues, and off-gases. The volume of wastes incinerated has increased in recent years due to the reluctance of the disposal industry to deal with medical wastes. Approximately 60% of all hospital waste generated in the United States is incinerated on-site.

Incineration is effective in treating all types of infectious waste, and provides the additional advantage of reducing disposal volume by as much as 95%.

Incinerators can be very efficient, but it is essential that operating personnel understand all operational constraints. Here are some things to remember when treating by incineration:

- . The EPA requires that chemotherapy wastes be incinerated in hazardous waste, not infectious waste, incinerators.
- . Maintain operating temperatures to ensure good burnout, meet air pollution requirements, and maximize the kill of infectious agents.
- . All operators must be properly trained and certified. Incorporate pollution control devices such as a baghouse or scrubber to lower the particulate content and acidity of emissions.
- . Do not overload the incinerator. As a rule of thumb, no more than 50% of the incinerator's volume should be charged at once and the largest item charged should be 10% of the incinerator's volume.
- . Monitor the contents of the waste stream to avoid temperature surges caused by wastes with high plastics content.
- . Periodically test the ash to determine whether it is a nonhazardous solid waste or a hazardous waste (40 CFR 261.2 and 40 CFR 262).
- . Do not incinerate infectious wastes in the beginning or end of the burn cycle. This will prevent the release of pathogens through the stack or into the ash residue.



STEAM STERILIZATION, also known as **AUTOCLAVING** is the treatment of infectious waste with saturated steam at a sufficiently elevated temperature to kill infectious agents. This is performed within an enclosed vessel known as an autoclave. Of the two models available on today's market, gravity displacement and pre-vacuum, the pre-vacuum model is reportedly more effective.

Steam sterilization can effectively treat all wastes which can be penetrated by steam. However, when used to treat pathological wastes, it is normally required that they be rendered unrecognizable before disposal. Some things to remember when operating an autoclave are:

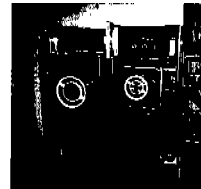
100% saturated steam is more efficient than either supersaturated or superheated steam. Monitor the autoclave to ensure recommended saturations and temperatures are maintained.

Trapped air dilutes steam and lessens the penetration of the wastes, therefore, loosen all bottle caps on large bottles and open any heat-resistant packages prior to sterilization.

Low density wastes are easily penetrated and require short residence times. However, high density items such as body parts require prolonged residence times. It is essential that wastes be maintained at the required temperature and specific residence time to adequately treat all waste components.

Monitor pressure gauges and thermometers throughout each treatment cycle.

Run weekly *Bacillus stearothermophilus* spore tests to monitor the effectiveness of the treatment. Record and keep the results.



GAS/VAPOR STERILIZATION is a treatment process whereby medical dressings, surgical instruments, supplies and sometimes wastes, are sterilized by a vaporized chemical in a sealed chamber. Ethylene Oxide (ETO) and formaldehyde, both probable carcinogens, are commonly used for this purpose. For this reason, the EPA strongly cautions against using this method for widespread use in treating medical waste.

Test all ETO sterilizers at least once weekly with *Bacillus subtilis* spores.

CHEMICAL DISINFECTION is the inactivation of waste by the addition of limited quantities of chemicals. Hydrogen peroxide, chlorine bleach, acids, alcohols, quaternary ammonium compounds, and ketones are

commonly used. Surfaces, utensils and medical supplies are chemically disinfected on a widespread basis, however, this method is not recommended for the treatment of waste or wastewater.

The following chemical disinfectants have been shown to be effective in inactivating HIV in laboratory testing: sodium hypochlorite, 0.1 -OS% available chlorine; chloramine 2%; ethanol 70%; 2-propanol (iso-propyl alcohol) 70%; polyvidone iodine 2.5%; formaldehyde 4%; glutaral 2%; and hydrogen peroxide 6%.

MICROWAVE DISINFECTION is a recently introduced treatment method in which wastes are continuously irradiated with microwaves. This method disinfects with low energy costs and no harmful emissions.

MEDICAL WASTE TO ENERGY facilities have been proposed and are being investigated as viable options to the medical waste disposal problem. Such facilities would incorporate state-of-the-art destructive technology to successfully sterilize and significantly reduce the volume of medical waste. They could feasibly avoid air emission problems and even generate steam or electricity for energy. Due to moisture content, pathological wastes would not be disposed of in this manner.

AUTOCLAVE/ENCAPSULATION is a recently introduced treatment and disposal system which has been implemented at some installations. The system is used to collect and dispose of syringes and other sharps. The sharps are decontaminated by steam and then encapsulated in an impervious, compact, plastic shell.

WHAT ARE THE PROS AND CONS OF **ONPOST** VERSUS **OFFPOST** TREATMENT AND DISPOSAL?

ONPOST VS OFFPOST DISPOSAL		
	Pros	Cons
Onsite	<p>Generator control thru the treatment stage.</p> <p>Minimization of packaging and transport problems.</p>	<p>Generator is responsible for meeting air, waste, and landfill regulations.</p>
Offsite	<p>Low initial costs.</p>	<p>Packaging and transport precautions must be taken to ensure containment.</p> <p>Generator must comply with all transport regulations.</p> <p>Generators are responsible for proper handling and treatment of offsite facility.</p>

The references used in this guide give additional information in this area. All references are listed at the end of the document.

SUMMARY

Recent awareness of the potential damage to health and environment has made infectious waste management an area of substantial concern. HCF Commanders are forced to make management decisions without concrete guidance.

The Federal government is contemplating regulation, some State governments have enacted regulation, while others are in the process of doing so. Rather than reacting to these rapid changes, Commanders should attempt to implement proactive infectious waste management programs.

ABOUT AEHA

The US Army Environmental Hygiene Agency is part of the Health Services Command. It provides advice and assistance in the following areas:

- Environmental Quality and Management
- Entomological Sciences
- Radiation and Health Physics
- Occupational Health
- Industrial Hygiene and Hazard Management
- Sanitation and Hygiene
- Laboratory Analysis

To help with general environmental and health needs, AEHA has direct support activities at Fort Meade, Fort McPherson, and Fitzsimmons Army Medical Center. The main agency at Aberdeen Proving Ground performs larger consultations and specialized work.

Any official representative can request **AEHA's** services. Since AEHA is mission funded, these services are free to Army installations. Projects with unusually large scopes or short time constraints may be conducted on a reimbursable basis

APPENDIX

STATE POINTS OF CONTACT

ALABAMA

Solid Waste Section, Land Division
Alabama Dept. of Environmental
Management
171 Cong. W.L. Dickinson Drive
Montgomery, Alabama 36130
(205) 271-7700

ALASKA

Air and Solid Waste Management
Section,
Environmental Quality Section,
Alaska Department of Environmental
Conservation
2330 Hospital Drive
Pouch 0
Juneau, Alaska 99811-1800
(907) 465-2666

ARIZONA

Arizona Department of
Environmental Quality
2005 N. Central Avenue
Phoenix, Arizona 85004
(602) 257-6989

ARKANSAS

Solid Waste Division,
Arkansas Dept. of Pollution
Control and Ecology
P.O. Box 9583
Little Rock, Arkansas 72219
(501) 562-7444

CALIFORNIA

Toxic Substances Division,
Hazardous Waste Management Section,
California Dept. of Health Services
714/744 P Street
P.O. Box 942732
Sacramento, California 94234-7320
(916) 324-9611

COLORADO

Colorado Department of Public Health,
Hazardous Materials and Waste
Management Division
4210 E. 11th Ave.
Denver, Colorado 80220
(303) 331-4859

CONNECTICUT

Solid Waste Management Unit,
Connecticut Environmental Protection Agency
165 Capitol Ave.
Hartford, Connecticut 06106
(203) 566-5847

DELAWARE

Solid Waste Management Branch,
Division of Air and Waste,
Dept. of Natural Resources and
Environmental Control
P.O. Box 1401
89 Kings Highway
Dover, Delaware 19903
(302) 736-5409

DISTRICT OF COLUMBIA

Solid Waste Control Division,
District of Columbia Public Works Dept.
2000 14th Street N.W.
Washington, D.C. 20009
(202) 783-3193

FLORIDA

Florida Dept. of Environmental Regulations
2600 Blair Stone Rd.
Tallahassee, Florida 32399-2400
(904) 488-0300

GEORGIA

Georgia Dept. of Natural Resources,
Industrial Waste Management Program
3420 Norman Berry Drive
7th Floor
Hapeville, Georgia 30354
(404) 669-3927

HAWAII

Hospital Medical Facilities Branch,
Hawaii Dept. of Health
1250 Punchbowl St.
Honolulu, Hawaii 96813
(808) 548-5935

IDAHO

Idaho Dept. of Health and Welfare
2220 Penitentiary Rd.
Boise, Idaho 83712
(208) 334-2235

ILLINOIS

Illinois Environmental Protection Agency
Division of Land Pollution Agency
200 Churchill Rd.
Springfield, Illinois 62706
(217) 782-6760

INDIANA

Indiana State Board of Health
1330 West Michigan Street
P.O. Box 1964
Indianapolis, Indiana 46206-1964
(317) 633-0731

IOWA

Solid Waste Section
Iowa Dept. of Natural Resources
Wallace State Office Building
90 E. Grand Avenue
Des Moines, Iowa 50319-0034
(515) 281-4968

KANSAS

Bureau of Waste Management
Kansas Dept. of Health and Environment
Topeka, Kansas 66620-0001
(913) 296-1593

KENTUCKY

Division of Waste
Kentucky Natural Resources
Cabinet
18 Reilly Rd.
Frankfort, Kentucky 40621
(502) 564-6716

LOUISIANA

Solid Waste Management Division,
Office of Solid and Hazardous Waste,
Louisiana Dept. of Environmental Quality
Natural Resources Building
625 N. Fourth St.
Baton Rouge, Louisiana 70802
(504) 342-9072

MAINE

Bureau of Oil and Hazardous
Materials Control,
Department of Environmental Protection
State House Station #17
Augusta, Maine 09333
(207) 289-2651

MARYLAND

Maryland Dept. of the Environment,
Hazardous and Solid Waste
Management Administration
2500 Broe Highway
Baltimore, Maryland 21224
(301) 631-3343

MASSACHUSETTS

Division of Community Sanitation,
Dept. of Public Health
600 Washington St., Room 770
Boston, Massachusetts 02111
(617) 727-2660

MICHIGAN

Michigan Dept. of Natural Resources,
Waste Management Division
P.O. Box 30241
Lansing, Michigan 48909
(517) 373-2730

MINNESOTA

Solid Waste Rule and Training Unit,
Minnesota Solid and Hazardous
Waste Division
520 Lafayette Road North
St. Paul, Minnesota 55155
(612) 296-7294

MISSISSIPPI

Mississippi Bureau of Pollution Control,
Dept. of Natural Resources
P.O. Box 10385
Jackson, Mississippi 39209
(601) 961-5171

MISSOURI

Missouri Department of Natural Resources,
Waste Management Program
P.O. Box 1368
117 East Dunklin
Jefferson City, Missouri 65102
(314) 751-3176

MONTANA

Solid and Hazardous Waste Bureau,
Dept. of Health and Environmental Sciences
Cogswell Bldg., Room B-201
Helena, Montana 59620
(406) 444-2821

NEBRASKA

Nebraska Dept. of Environmental Control
State House Station
P.O. Box 98922
Lincoln, Nebraska 68509
(402) 471-4217

NEVADA

Waste Management Program,
Division of Environmental Protection,
Dept. of Conservation and Natural Resources
Capitol Complex
201 South Fall St.
Carson City, Nevada 89710
(702) 885-4750

NEW HAMPSHIRE

Solid Waste Bureau, Waste
Management Division,
Dept. of Environmental Services
6 Hagen Drive
Concord, New Hampshire 03301
(603) 271-2925

NEW JERSEY

Division of Waste Management,
Dept. of Environmental Protection
332 East Hanover St. CN-027
Trenton, New Jersey 08625
(609) 984-4892

NEW MEXICO

New Mexico Health and Environment Dept.,
Environmental Improvement Division,
Special Waste Bureau N2250
1190 St. Francis Drive
Santa Fe, New Mexico 87503
(505) 827-2929

NEW YORK

New York Dept. of Environmental Conservation,
Division of Hazardous Substances Regulation
50 Wolf Rd.
Albany, New York 12233-7252
(518) 457-6693

NORTH CAROLINA

Dept. of Human Resources,
Division of Health Services
P.O. Box 2091
Raleigh, North Carolina 27602-2091
(919) 733-0692

NORTH DAKOTA

Hazardous Waste Management Division,
North Dakota State Dept. of
Health and Consolidated Laboratories
1200 Missouri Avenue
Bismarck, North Dakota 58502
(701) 224-2366

OHIO

Division of Solid and
Hazardous Waste Management,
Ohio Environmental Protection Agency
1800 Watermark Dr.
P.O. Box 1049
Columbus, Ohio 43266-0149

OKLAHOMA

Waste Management Service,
Oklahoma State Dept. of Health
P.O. Box 53551
1000 N.E. 10th Street
Oklahoma City, Oklahoma 73152
(405) 271-7159

OREGON

Hazardous and Solid Waste Division,
Solid Waste Section
811 SW 6th Avenue
Portland, Oregon 97204
(503) 229-5965

PENNSYLVANIA

Bureau of Waste Management,
PA Department of Environmental Resources
P.O. Box 2063
Harrisburg, Pennsylvania 17120
(717) 787-6052

PUERTO RICO

Environmental Quality Board,
Office of the Governor
P.O. Box 11488
Santurce, Puerto Rico 00910
(809) 725-8992

RHODE ISLAND

Solid Waste Management Program,
Department of Environmental Management
204 Canon Building
75 Davis Street
Providence, Rhode Island 02908
(401) 277-6500

SOUTH CAROLINA

Solid and Hazardous Waste
Management Bureau,
South Carolina Dept. of Health
and Environmental Control
2600 Bull St.
PO. Box 11628
Columbia, South Carolina 29201
(803) 7345200

SOUTH DAKOTA

Division of Air Quality and Solid Waste,
South Dakota Waste and Natural
Resources Department
Joe Foss Building
523 E. Capitol Ave.
Pierre, South Dakota 57501
(605) 773-3151

TENNESSEE

Tennessee Dept. of Health and Environment,
Division of Solid Waste Management
Customs House, Fourth Floor
701 Broadway
Nashville, Tennessee 372195403
(615) 741-3424

TEXAS

Infectious Disease Program,
Texas Department of Health
1100 W. 49th Street
Austin, Texas 78756
(512) 458-7328

UTAH

Utah Division of Environmental Health,
Bureau of Hazardous Wastes
4231 State Office Building
Salt Lake City, UT 84145
(801) 533-4145

VERMONT

Hazardous Waste Management,
Hazardous Materials Division
103 South Main St.
West Building
Waterbury, Vermont 05676
(802) 244-8702

VIRGINIA

Division of Research and Development,
Virginia Department of Waste Management
101 North 14th Street
Richmond, Virginia 23219
(804) 225-2667

WASHINGTON

Solid and Hazardous Waste
Management Division
Department of Ecology
Mail Stop PV-1
Olympia, Washington 98504
(206) 459-6598

WEST VIRGINIA

Office of Environmental Health Services,
West Virginia Department of Health
1800 Washington St., East
Charleston, West Virginia 25305
(303) 348-2981

WISCONSIN

Office of the Governor
State Capitol
P.O. Box 7863
Madison, Wisconsin 53707
(608) 266-1212

WYOMING

Department of Health and
Social Services
(307) 777-7121

REFERENCES

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